12-23-99

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PATENT APPLICATION TRANSMITTAL LETTER (Large Entity)	Docket No. FI9-99-140

TO THE ASSISTANT COMMISSIONER FOR PATENTS

Transmitted herewith for filing under 35 U.S.C. 111 and 37 C.F.R. 1.53 is the patent application of:

Michael T. White, et al

Enhanced Security Features for an Automated Order Fulfillment System

Enclosed are:

☒ Certificate of Mailing with Express Mail Mailing Label No.   EK082874135US
☒ **5** sheets of drawings.
☐ A certified copy of a   application.
☒ Declaration   ☒ Signed.   ☐ Unsigned.
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☐ Preliminary Amendment
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Multiple Dependent Claims (check if applicable) ☐					$0.00
				BASIC FEE	$760.00
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DATE OF DEPOSIT: 12/22/99

BY SIGNATURE & DATE: _____ 12/22/99

Signature
Jay H. Anderson Reg. # 38,371
IBM Corporation
Intellectual Property Law Dept
18/G, Z/482, B/300, 1580 Route 52
Hopewell Junction, NY 12533-6531
Telephone 914-894-3667

FI(639)
CC:

P01LARGE/REV06

APPLICATION

FOR

UNITED STATES LETTERS PATENT

APPLICANT NAME: Michael T. White, et al.

TITLE: Enhanced Security Features for an Automated Order Fulfillment System

DOCKET NO.:FI9-99-140

INTERNATIONAL BUSINESS MACHINES CORPORATION

ENHANCED SECURITY FEATURES
FOR AN AUTOMATED ORDER FULFILLMENT SYSTEM

FIELD OF THE INVENTION

This invention relates to improvements in an automated system for managing fulfillment of customer orders, and more particularly to security enhancements to prevent fraud by system users.

BACKGROUND OF THE INVENTION

A number of processes related to the fulfillment of customer orders lend themselves to automation. For example, systems have been developed for (1) scheduling the shipment of goods to a customer and (2) managing customer accounts payable. More recently, an integrated system for managing the fulfillment of orders has become available. An example of such an integrated system is the SAP™ system ("Systems, Applications, Products and Data Processing") offered by SAP AG, Walldorf, Germany.

Security functions in separate materials management and customer accounts-payable systems, providing safeguards against fraud and inappropriate business practices, can be inadequate when those systems are integrated (for example, into the SAP system). Each user (known to the system by his user ID) has a "security profile" listing the transactions he may approve or the tasks he is authorized to perform. Some of these transactions are incompatible, in the sense that having them

under control of a single individual could result in abuse of the system. For example, a user authorized both (1) to approve the shipment of goods to a certain customer and (2) to adjust the amount owed by a customer, could fraudulently ship goods to himself free of charge. Furthermore, an individual with a single user ID but multiple security profiles could initiate a transaction under one profile, then instruct the system to perform an incompatible transaction appearing under another profile.

Accordingly, there is a need for improved security in an automated system for managing the fulfillment of orders, whereby the security profiles of users are analyzed and modified to prevent incompatible transactions by those users.

SUMMARY OF THE INVENTION

The present invention provides a system for the separation of incompatible transactions within a system such as the SAP system, so that critical tasks (those tasks susceptible to abuse or fraud) may be assigned to different individuals. In accordance with the invention, this system determines which transactions in a user's security profile are incompatible with each other, and then generates a report indicating the security profile which has incompatible transactions. The security profiles may then be modified, to prevent inappropriate business conduct including fraud and misuse of funds.

According to a first aspect of the present invention, a method is provided which includes the steps of assigning a user identifier to each user of the system; preparing a security profile corresponding to each identifier, where each security profile includes a set of authorized transactions; and preparing a list of pairs of incompatible transactions in accordance with predetermined rules of business conduct. Then,

according to this method, each security profile is compared with that list, to identify security profiles including at least one pair of incompatible transactions. A report is generated indicating those security profiles which include incompatible transactions and the user identifiers associated with those security profiles. If a security profile is found to have a pair of incompatible transactions, it may be modified; alternatively, the list of pairs of incompatible transactions may be modified, so that the security profile does not include a pair of incompatible transactions. Another report may then be generated indicating the modification made.

A given user identifier may have more than one security profile associated therewith. In accordance with a second aspect of the invention, a method is provided which includes the steps of assigning a user identifier to each user of the system; preparing a plurality of security profiles, where each user identifier is associated with at least one security profile; and preparing a list of pairs of incompatible transactions in accordance with predetermined business conduct rules. Furthermore, the method includes the steps of generating a set of transactions in all of the security profiles associated with each user identifier, and comparing that set of transactions with the list of pairs of incompatible transactions. This method therefore permits identification of user identifiers having associated therewith at least one pair of incompatible transactions, even if those transactions are in different security profiles. A report is then generated indicating those user identifiers. A security profile associated with such a user identifier may be modified; alternatively, the list of pairs of incompatible transactions may be modified, so that the user identifier no longer has a pair of incompatible transactions associated therewith. Another report may then be generated indicating any modification which has been made.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic block diagram of a computer system on which software embodying the present invention is loaded, and which includes a storage device for storing user IDs, security profiles, and transaction tables used in accordance with the present invention.

Figure 2A illustrates in tabular form the structure of the user ID database.

Figure 2B illustrates in tabular form the structure of the security profile database.

Figure 3A illustrates the structure of a table of critical transactions.

Figure 3B illustrates the structure of a table of incompatible critical transactions.

Figure 4 is a flowchart showing a method for analyzing security profiles and generating a report of incompatible transactions in a profile, according to a first embodiment of the present invention.

Figures 5A and 5B are connected flowcharts showing a method for analyzing security profiles associated with a given user ID and generating a report of incompatible transactions for that user, according to a second embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 is a block diagram of a computer system 100 on which is loaded a system 101 for managing fulfillment of orders (e.g. the SAP system) which includes a system 110 for separating critical tasks or transactions among various system users, according to the present invention. The computer system 100 also includes a storage device 120, in

which is stored a table 121 of user IDs for the system 101; security profiles 122 comprising lists of specific critical transactions; and tables 123 of critical transactions and combinations of incompatible transactions. The systems 101 and 110 access these tables, as shown schematically in Figure 1.

The storage device 120 may be an integral part of the computer system 100, as shown in Figure 1, or may be external to it. The executable code for the system 110 and the databases 121-123 may be stored on a variety of possible computer-readable media (RAM, ROM, CD-ROM, etc.).

The system 110 of the present invention is shown in Figure 1 as integrated into the commercially available system 101 for managing fulfillment of orders. Alternatively, the system 110 may be separate from system 101, or be invoked as a subroutine from system 101 (in which case the analysis of critical transactions may itself be viewed as a critical transaction, to be performed only by certain selected users). The user IDs 121, profiles 122 and tables 123 contain information used in the analysis, as detailed below.

As shown in Figure 2A, each user of the system 101 is assigned one record in the user ID database 121. Each record has fields 201 and 202 for the user ID and user name respectively, and a field 203 identifying the security profile or profiles assigned to that user. A given user may have a unique or custom-designed profile (for example, profile #1 in Figure 2A), have a single standard profile (such as profiles #2 and #3), or may be assigned multiple profiles. The database of security profiles is shown in Figure 2B. Each profile identifier is associated with a group of critical transactions; the identifiers for the transactions in a given profile are listed in field 204. In this illustration, the transactions are identified by a four-character code. A system user with a given user ID is

authorized to perform any of the transactions in the profile or profiles assigned to his user ID.

The profiles are constructed and analyzed using tables 123-1 and 123-2 of critical transactions and incompatible combinations thereof, as shown in Figures 3A and 3B. Figure 3A shows the structure of table 123-1, which has a list of all the critical transactions performed in system 101. Only the critical transactions--that is, those susceptible to abuse or fraud--need be listed in table 123-1. Each record of table 123-1 has the identifier 205 of the transaction, and the name of the transaction 206. Table 123-2, which is developed manually using the organization's rules and instructions (e.g. corporate "Business Conduct Guidelines"), lists combinations of critical transactions deemed incompatible: transactions which, if performed by the same user, would permit misuse of the system or fraud. Each record 301 of this table has the identifiers of two transactions which should not appear in the same security profile, or in a set of security profiles belonging to a particular system user.

In the following embodiments of the invention, the processes of identifying and tabulating incompatible transactions are not fully automated. It will be appreciated that these processes depend upon an understanding of both the order-fulfillment management system and the business-conduct ethics governing the organization using the system. These particular processes require a level of professional judgment in accordance with generally accepted accounting practices ("GAAP"), which then are implemented by a human system administrator.

A flowchart of a method of analyzing a security profile, according to a first embodiment of the invention, is shown in Figure 4. In step 401, the table 122 of security profiles is built and stored in memory. In step 402, the combinations of

critical transactions which are incompatible are identified. In a corporate environment, the corporate rules and instructions 450 serve as input for this step. The table 123-2, which lists all the combinations of incompatible transactions, is then built (step 403).

The identifier 203 of the profile to be analyzed is input by the system administrator, and this profile is retrieved from memory (step 404), and the transactions associated with that profile are compared with the table 123-2 (step 405). The results of this comparison (step 406) are included in a report (here referred to as Report #1). If no conflicting transactions exist in the profile, the report states that result (step 407). If one or more pairs of conflicting transactions are found, these are listed in the report (step 410). At this point (step 411), the person performing the analysis may modify the profile or the table 123-2 to remove the conflict between transactions. Alternatively, he may choose to allow the conflicting transactions to remain in the profile, and prepare a memo to management justifying this course of action.

It will be appreciated that these steps may be performed using an incomplete profile, so that the profile may be built without having incompatible transactions. In particular, it is desirable to analyze the profile (and make any necessary adjustments) while the order-fulfillment management system is in development, before it is moved to a production environment.

According to a second embodiment of the invention, another report (termed Report #2) is generated in connection with the analysis shown in the flowcharts of Figures 5A and 5B. Using a user ID as input, this report lists all of the transactions that are in conflict across all the profiles associated with that user ID. In steps 501-503, the tables 122 and 123-2 are built, as described above with reference to

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steps 401-403.

In accordance with input from the system administrator, a user ID is retrieved from the user ID database 121 (step 504), and a profile associated with that user ID is retrieved from database 122 (step 505; see Figures 2A and 2B). However, a particular user may be authorized to perform tasks or approve transactions from more than one security profile. All of the profiles associated with that user ID are retrieved (steps 505-507), and the transactions of those profiles are collected in a single, temporary list which is compared with the list of incompatible transactions in table 123-2 (step 508). Accordingly, all incompatible transactions belonging to a user ID are identified, whether that user ID has a single security profile or multiple profiles.

If the user ID does not have any profiles with incompatible transactions, Report #2 states that result (step 510). If, however, a set of incompatible transactions is found (step 509), those transactions are listed in Report #2 (step 511), along with the user ID and the profile(s) in which the transactions appear. As in the first embodiment, the person performing the analysis may take a number of actions to resolve the presence of incompatible transactions (step 521): modify the profile, modify the table 123-2, or justify the continuance of conflicting transactions belonging to the user ID.

It is desirable to produce another report (Report #3) which provides an audit trail; that is, a report listing all the activity that has occurred against the transaction table 123-2. Thus if the system administrator intervenes to remove a conflict in a security profile, this action will be documented (step 601 in Figures 4 and 5B).

It will be appreciated that this procedure may be used when developing and testing a set of profiles for a system user. In that event, a dummy user ID with those profiles

assigned may be used as input. In addition, if it is desired to analyze a single profile with the procedure of Figures 5A and 5B, a dummy user ID with that profile may be used as input.

5   While the invention has been described in terms of specific embodiments, it is evident in view of the foregoing description that numerous alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, the invention is intended to encompass all such

10   alternatives, modifications and variations which fall within the scope and spirit of the invention and the following claims.

We claim:

1.   1. A method for facilitating implementation of an automated
2.   system for transacting business, the system having a
3.   plurality of users, the users being subject to predetermined
4.   rules governing business conduct, the method comprising the
5.   steps of:
6.   assigning a user identifier to each user of the system;
7.   preparing a security profile corresponding to each
8.   identifier, each security profile including a set of
9.   authorized transactions;
10.   preparing a list of pairs of incompatible transactions
11.   in accordance with said predetermined rules;
12.   comparing each security profile with said list, to
13.   identify security profiles including at least one pair of
14.   incompatible transactions; and
15.   generating a report indicating those security profiles
16.   which include incompatible transactions and the user
17.   identifiers associated with those security profiles.

1.   2. A method according to claim 1, further comprising the
2.   steps of:
3.   after said preparing steps, storing the security
4.   profiles and the list of pairs of incompatible transactions
5.   in a computer-readable storage medium; and
6.   retrieving the security profiles and the list of pairs
7.   of incompatible transactions from the computer-readable
8.   storage medium,
9.   wherein said comparing step and said generating step are
10.   automated.

1 3. A method according to claim 1, further comprising the
2 steps of:
3   modifying at least one of
4   (a) a security profile including a pair of
5 incompatible transactions, and
6   (b) said list of pairs of incompatible
7 transactions, so that said security profile after
8 modification does not include a pair of incompatible
9 transactions; and
10   generating a report indicating the modification made in
11 said modifying step.

1 4. A method for facilitating implementation of an automated
2 system for transacting business, the system having a
3 plurality of users, the users being subject to predetermined
4 rules governing business conduct, the method comprising the
5 steps of:
6   assigning a user identifier to each user of the system;
7   preparing a plurality of security profiles each
8 including a set of authorized transactions, each user
9 identifier being associated with at least one security
10 profile;
11   preparing a list of pairs of incompatible transactions
12 in accordance with said predetermined rules;
13   generating a set of transactions for each user
14 identifier, the set of transactions for a given user
15 identifier including all of the transactions in the security
16 profiles associated with said user identifier;
17   comparing said set of transactions with said list, to
18 identify user identifiers having associated therewith at
19 least one pair of incompatible transactions; and
20   generating a report indicating those user identifiers
21 identified in said comparing step.

1 5. A method according to claim 4, further comprising the
2 steps of:
3   after said preparing steps, storing the security
4 profiles and the list of pairs of incompatible transactions
5 in a computer-readable storage medium; and
6   retrieving the security profiles and the list of pairs
7 of incompatible transactions from the computer-readable
8 storage medium,
9   wherein said comparing step and said generating steps
10 are automated.

1 6. A method according to claim 4, further comprising the
2 steps of:
3   modifying at least one of
4   (a) a security profile associated with a user
5 identifier for a user authorized to perform a pair of
6 incompatible transactions, and
7   (b) said list of pairs of incompatible
8 transactions, so that after modification said user identifier
9 does not have associated therewith a pair of incompatible
10 transactions; and
11   generating a report indicating the modification made in
12 said modifying step.

1 7. A computer-readable medium having stored therein
2 instructions for performing a method for facilitating
3 implementation of an automated system for transacting
4 business, the system having a plurality of users, the users
5 being subject to predetermined rules governing business
6 conduct, the method comprising the steps of:
7   retrieving a security profile associated with each user
8 identifier, the security profile including a set of
9 authorized transactions;
10   retrieving a list of pairs of incompatible transactions,

11 where said list is prepared in accordance with said
12 predetermined rules;
13   comparing each security profile with said list, to
14 identify security profiles including at least one pair of
15 incompatible transactions; and
16   generating a report indicating those security profiles
17 which include incompatible transactions and the user
18 identifiers associated with those security profiles.

1   8. A computer-readable medium having stored therein
2   instructions for performing a method for facilitating
3   implementation of an automated system for transacting
4   business, the system having a plurality of users, the users
5   being subject to predetermined rules governing business
6   conduct, the method comprising the steps of:
7   retrieving all security profiles associated with each
8   user identifier, the security profiles each including a set
9   of authorized transactions;
10   retrieving a list of pairs of incompatible transactions,
11 where said list is prepared in accordance with said
12 predetermined rules;
13   generating a set of transactions for each user
14 identifier, the set of transactions for a given user
15 identifier including all of the transactions in the security
16 profiles associated with said user identifier;
17   comparing said set of transactions with said list, to
18 identify user identifiers having associated therewith at
19 least one pair of incompatible transactions; and
20   generating a report indicating those user identifiers
21 identified in said comparing step.

ENHANCED SECURITY FEATURES
FOR AN AUTOMATED ORDER FULFILLMENT SYSTEM

ABSTRACT OF THE DISCLOSURE

A method is described for facilitating implementation of an automated system for transacting business, where the system users are subject to predetermined rules governing business conduct. Each user is assigned a user ID and has a

5   security profile, which lists the transactions that user is authorized to perform. A list is prepared of pairs of incompatible transactions (transactions which, if performed by the same user, would violate the predetermined rules). Each security profile is compared with the list, to identify

10   security profiles including at least one pair of incompatible transactions. A report is then generated indicating those security profiles which include incompatible transactions and the user identifiers associated with those security profiles.
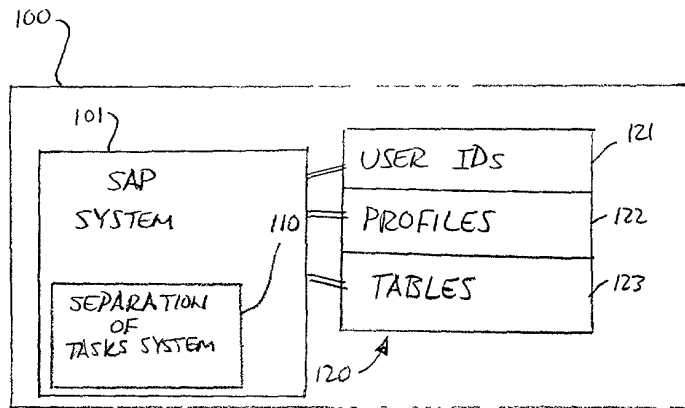
FIG 1

FIG 2A

FIG. 2B

123-1

TRANSACTION ID	TRANSACTION NAME
MM01	INITIATE ITEM BUILD
MM02	SHIP TO CUSTOMER
MM03	RETURN ITEM TO STOCK
VA01	SEND CUSTOMER INVOICE
VA02	CREATE ORDER
VA04	CREDIT CUSTOMER ACCT.
⋮	⋮

205   206

FIG. 3A

123-2   301

TRANSACTION ID	TRANSACTION ID
MM01	VA02
MM01	VA04
MM01	MM02
MM01	MM03
VA02	MM01
VA02	MM02
⋮	⋮

FIG 3B

START

BUILD SECURITY
PROFILES AND STORE
IN MEMORY — 401

CORPORATE
RULES
AND
INSTRUCTIONS — 450

IDENTIFY
INCOMPATIBLE
TRANSACTIONS — 402

DEFINE TABLE
OF INCOMPATIBLE
COMBINATIONS — 403

PROFILE ID

RETRIEVE PROFILE
FROM MEMORY — 404

COMPARE PROFILE
WITH TABLE OF
INCOMPATIBLE
COMBINATIONS — 405

406 — INCOMPATIBLE
COMBINATION
IN
PROFILE
?

Y — ADD TO
REPORT
#1 — 410

N

REPORT #1:
NO INCOMPATIBLE
TRANSACTIONS
FOUND — 407

MODIFY PROFILE
or
MODIFY TABLE
or
WRITE JUSTIFYING
MEMO — 411

MODIFY
TABLE;
ADD TO
REPORT #3 — 601

END

FIG. 4

START

BUILD SECURITY
PROFILES AND
STORE IN MEMORY   501

CORPORATE
RULES
AND
INSTRUCTIONS

450

IDENTIFY
INCOMPATIBLE
TRANSACTIONS   502

DEFINE TABLE
OF INCOMPATIBLE
COMBINATIONS   503

USER ID

RETRIEVE USER ID
FROM MEMORY   504

RETRIEVE PROFILE
FROM MEMORY   505

ADD TRANSACTIONS
TO USER ID LIST   506

ANOTHER
PROFILE
?   507

Y

N

COMPARE USER ID
TRANSACTION LIST
WITH TABLE OF
INCOMPATIBLE
COMBINATIONS   508

A

FIG. 5A

A

509 INCOMPATIBLE COMBINATION IN TRANSACTION LIST ?

Y

520 ADD TO REPORT #2

521 MODIFY PROFILE(S)
or
MODIFY TABLE
or
WRITE JUSTIFYING MEMO

601 MODIFY TABLE:
ADD TO REPORT #3

N

510 REPORT #2:
NO INCOMPATIBLE TRANSACTIONS FOUND

END
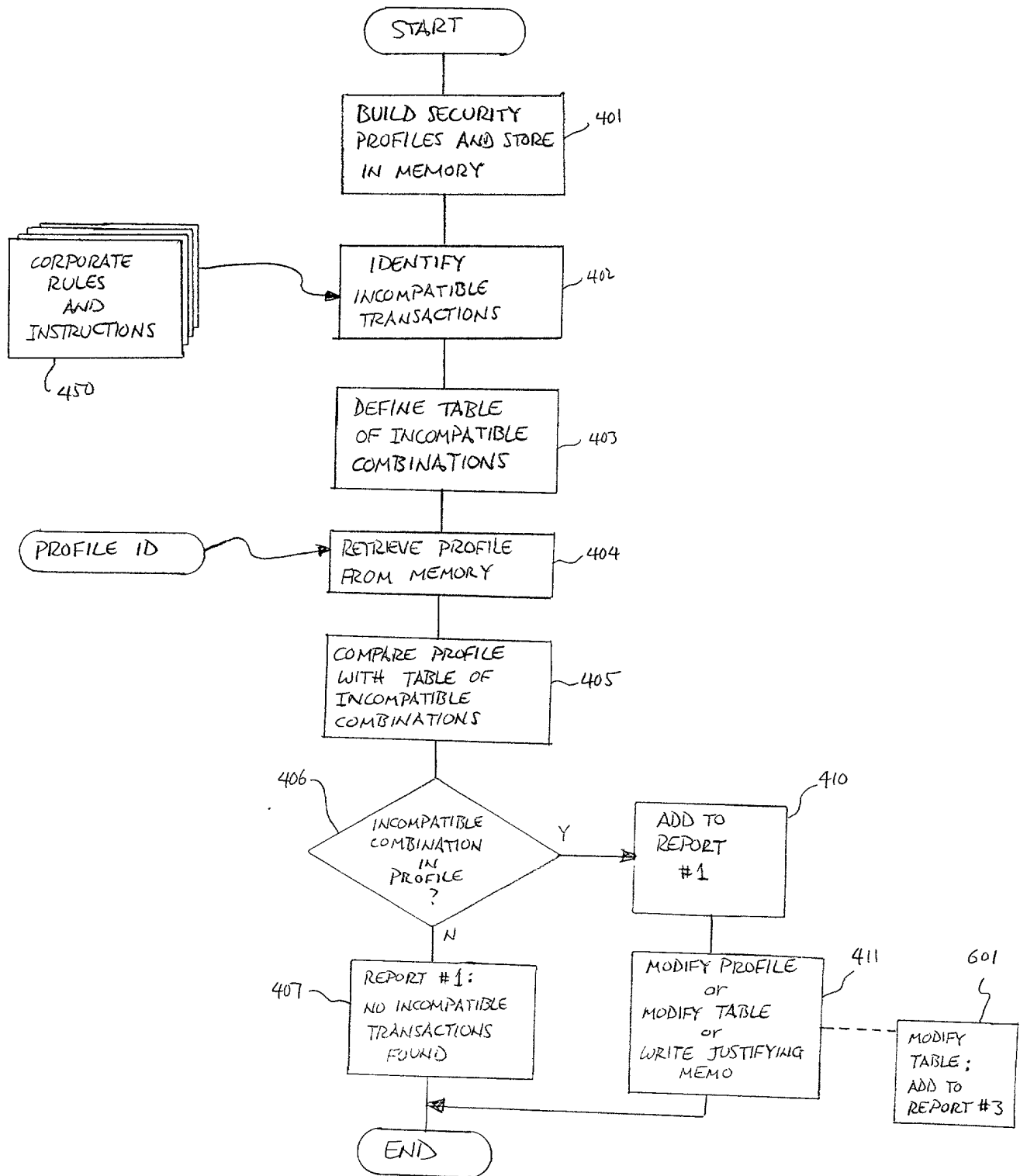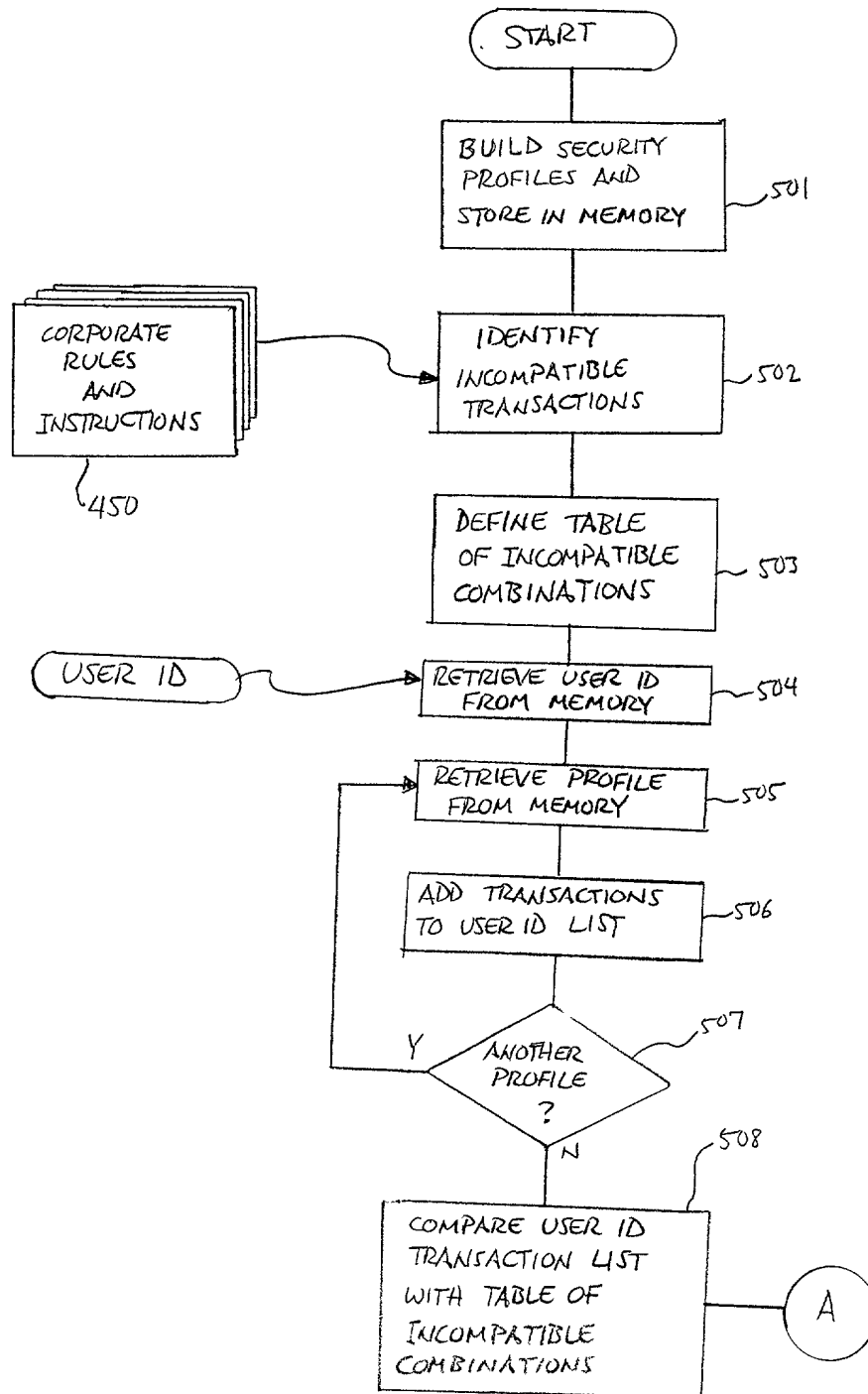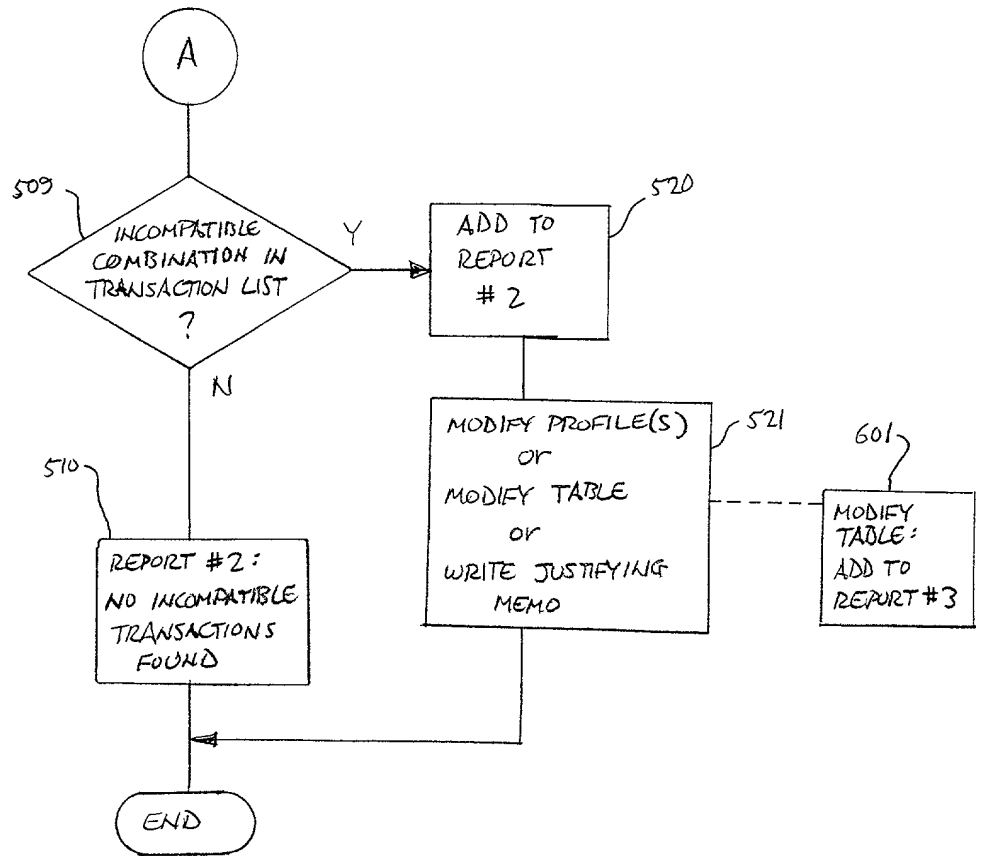
FIG. 5B

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office, address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if the only name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ENHANCED SECURITY FEATURES FOR AN AUTOMATED ORDER FULFILLMENT SYSTEM

the specification of which (check one)

_____X_____ is attached hereto.

_____ was filed on
Application Serial No.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Applications:

Number	Country	Date Filed	Priority Claimed (Yes or No)
N/A			

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status (patented, pending, abandoned)
N/A		

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As the named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (list name & registration no.): **Marc D. Schechter, Registration No. 28,989; Susan M. Murray, Registration No. 38,252; Joseph P. Abate, Registration No. 30,238; Aziz M. Ahsan, Registration No. 32,100; Jay H. Anderson, Registration No. 38,371; Lawrence D. Cutter, Registration No. 28,501; Ira D. Blecker, Registration No. 29,894; Tiffany L. Townsend, Registration No. 43,199; Steven Capella, Registration No. 33,086; Daryl K. Neff, Registration No. 38,253; Eric W. Petraske, Registration No. 28,459; and H. Daniel Schnurmann, Registration No. 35,791, all of INTERNATIONAL BUSINESS MACHINES CORPORATION; and Christopher A. Hughes, Registration No. 26,914; Edward A. Pennington, Registration No. 32,588; John E. Hoel, Registration No. 26,279; and Joseph C. Redmond, Jr., Registration No. 18,753, all of MORGAN AND FINNEGAN.**

Send correspondence to: **Jay H. Anderson, IBM Corporation, Intellectual Property Law Dept., 18/G, Z/482, B/300, 1580 Route 52, Hopewell Junction, New York   12533**

Direct telephone calls to: **Jay H. Anderson, 914-894-3667**

INVENTORS:

==

Full name of first joint inventor: **Michael T. White**

Inventor signature: _____ Date: _12/20/1999_

Residence: **4 Farview Road, Hopewell Junction, New York 12533**

Citizenship: **United States of America**

Post Office address: **Same as Residence**

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Full name of second joint inventor: **Cathy A. Martin**

Inventor signature: _____ Date: _13/21/99_

Residence: **65 Hamlet Court, Wappingers Falls, New York 12590**

Citizenship: **United States of America**

Post Office address: **Same as Residence**

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Full name of third joint inventor: **Mary Ann Moore**

Inventor signature: _____ Date: _13/21/99_

Residence: **160 Pleasant Ridge Road, Poughquag, New York 12570**

Citizenship: **United States of America**

Post Office address: **P.O. Box 776, Pleasant Ridge Road, Poughquag, New York   12570**

==

===

Full name of fourth joint inventor: **David Z. Neill**

Inventor signature: Date:

Residence: **55 Larchfield, Dunboyne, County Meath, Republic of Ireland**

Citizenship: **United States of America**

Post Office address: **c/o IBM Microelectronics Division, Damastown Industrial Estate, Mulhuddart, Dublin 15, Republic of Ireland**

===

IBM Docket No. FI9-99-140

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office, address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if the only name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ENHANCED SECURITY FEATURES FOR AN AUTOMATED ORDER FULFILLMENT SYSTEM

the specification of which (check one)

___X___   is attached hereto.

_____   was filed on
           Application Serial No.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Applications:

Number	Country	Date Filed	Priority Claimed (Yes or No)
N/A			

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status (patented, pending, abandoned)
N/A		

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

IBM Docket No. FI 9-99-140

POWER OF ATTORNEY: As the named Inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (list name & registration no.):   Marc D. Schechter, Registration No. 28,983; Susan M. Murray, Registration No. 38,252; Joseph P. Abate, Registration No. 30,238; Aziz M. Ahsan, Registration No. 32,100; Jay H. Anderson, Registration No. 38,371; Lawrence D. Cutter, Registration No. 28,501; Ira D. Blecker, Registration No. 29,894; Tiffany L. Townsend, Registration No. 43,199; Steven Capella, Registration No. 33,086; Daryl K. Neff, Registration No. 38,253; Eric W. Petraske, Registration No. 28,459; and H. Daniel Schnurmann, Registration No. 35,791, all of INTERNATIONAL BUSINESS MACHINES CORPORATION; and Christopher A. Hughes, Registration No. 26,914; Edward A. Pennington, Registration No. 32,588; John E. Hoel, Registration No. 26,279; and Joseph C. Redmond, Jr., Registration No. 18,753, all of MORGAN AND FINNEGAN.

Send correspondence to: Jay H. Anderson, IBM Corporation, Intellectual Property Law Dept., 18/G, Z/452, B/300, 1580 Route 52, Hopewell Junction, New York 12533

Direct telephone calls to: Jay H. Anderson, 914-894-3667

INVENTORS:

Full name of first joint inventor: Michael T. White

Inventor signature:	Date:

Residence: 4 Farview Road, Hopewell Junction, New York 12533

Citizenship: United States of America

Post Office address: Same as Residence

Full name of second joint Inventor: Cathy A. Martin

Inventor signature:	Date:

Residence: 65 Hamlet Court, Wappingers Falls, New York 12590

Citizenship: United States of America

Post Office address: Same as Residence

Full name of third joint Inventor: Mary Ann Moore

Inventor signature:	Date:

Residence: 160 Pleasant Ridge Road, Poughquag, New York 12570
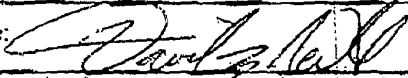
Citizenship: United States of America

Post Office address: P.O. Box 776, Pleasant Ridge Road, Poughquag, New York 12570

Full name of fourth joint inventor: David Z. Neill

Inventor signature: _____   Date: 12/21/99

Residence: 65 Larchfield, Dunboyne, County Meath, Republic of Ireland

Citizenship: United States of America

Post Office address: c/o IBM Microelectronics Division, Damastown Industrial Estate, Mulhuddart, Dublin 15, Republic of Ireland